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October 28, 1988

TO: Roger Stanley

FROM: Alan Newman AN

SUBJECT: Hanford 300 Area Sewage Treatment Proposal

I have reviewed the conceptual design report produced by Kaiser Engineers. The facility proposed is capable of meeting a 30/30 effluent. Based on the information presented, I am not certain that the proposed facility is capable of meeting the nitrate requirements for a discharge to groundwater through the proposed seepage beds. In reviewing the proposed design, it appears that the overall effect of the design on operation requirements and capital cost expenditures was not a prime consideration.

The proposed aerated facultative lagoons process could be enlarged to provide 100 percent of the wastewater treatment. A lagoon system with long detention time (60 days or more) could meet groundwater discharge requirements. Conversely, an expanded oxidation ditch would work equally well to produce effluent meeting surface water discharge requirements. The oxidation ditch process could even be modified to produce a nitrate level acceptable for groundwater discharge.

As we discussed, land is available for an entirely lagoon treatment system. The orientation and size of the lagoon system is up to the designer within the constraints of the site topography. If a pump is required to move the wastewater to the site, orientation and location is more adjustable.

One discharge concept to consider (with the seepage proximity to the Columbia River and the direction of groundwater flow in this area) is that the seepage beds are actually an in-bank river discharge diffuser. A discharge to the ground through perforated pipes or, if still desired, open seepage trenches that parallel the Columbia River could be considered by you to be not a discharge to groundwater but a discharge to the Columbia River. The gravels and sand provide a filtering and dispersion action as the effluent travels downward to the groundwater. A discharge with this concept could be arranged so that there would be no plume interference with the Superfund and RCRA areas immediate south of the proposed treatment plant site.

Changing from the proposed mechanical oriented facility to a solely unaerated lagoon facility will eliminate a great deal of operation and maintenance time. Don Provost noted long-term maintenance of non-critical facilities by the Department of Energy has been poor in the past.

As Ed O'Brien suggested, a direct discharge to the Columbia River must be investigated. There are options to installing an outfall that do not involve disturbing possible Indian artifacts in the existing river bank and the area just below water level. A pipe on the surface of the ground within the Hanford Reservation area would be entirely appropriate. The pipe should not suffer vandalism problems that it might otherwise be prone to because of the nature of the security on the Hanford Reservation.

The specific comments I have on this report are as follows:

1. Page 3. The text states that flow rates for peak flows currently range from 325,000 gpd in the winter to 575,000 gpd in the summer, with 215,000 and 400,000 gpd averages. The design criteria requires removal of an undefined amount of cooling water from the wastewater and then uses a 300,000 gpd average flow rate for design. There should be more background information to substantiate this design flow.

2. Page 7 discusses removal of cooling water by work in the 325, 326, and 328 buildings but doesn't quantify the amount that can be removed. The amount of flow reduction (both average and peak) must be noted. This page mentions that the existing septic tanks need to be decommissioned but doesn't mention how this will be accomplished. Decommissioning should be covered. In addition to the concern about floodproofing from the 100-year flood of the Columbia River, the discussion on the influent sewer needs to consider the minimum depth of cover to prevent freezing of the pipeline and the wastewater in it. I believe that three feet of cover is the amount normally required in this area to prevent pipe freezing.

3. Page 9. The design of the facility has 500 lbs. per day of biochemical oxygen demand and 500 lbs per day of suspended solids. This is a bit low if this were a purely domestic source. For a community of 3000, you would expect to find 600 lbs. per day loading rate for each of these parameters. A setting such asa this, with 24-hour occupation and food service, would be similar. Since a considerable portion of the load on this facility is from animal handling, a quantification of the waste generated by these activities must be done as part of the development process. In my experience, the amount of waste generated in animals is directly related to the success or failure of a facility handling animal waste. It takes very few extra animals (over the design number) to overload a treatment facility. Dogs appear to produce waste nearly as strong (but with more suspended solids) as humans do, where fish produce a much weaker waste and in much lower quantities. I have no experience with primates so I am unsure of their waste generation in comparison with humans.

4. Page 11. The proposed size of the facultative ponds is too small on a pounds per acre day rate for a facultative pond. It is also too small to meet the EPA criteria. I cannot evaluate the effect of aeration since oxygen transfer rates are not given for the aerations. I suggest that a high-density polyethylene liner or a buried PVC liner be used for the lagoon lining. On this page is the first mention of surface aeration and air powered diaphragm pumps for pumping water out of the ponds. Instrumentation for dissolved oxygen monitoring is also mentioned. Currently, there are no continuously reliable dissolved oxygen monitors on the market. All of them require regular, periodic maintenance (on the order of one week or less) between maintenance in order to maintain some basic reliability.

5. Page 13. Wasting sludge from the oxidation ditch to the lagoon is proposed. This is not an appropriate method of sludge wasting. The partially stabilized, activated sludge should be put to drying beds immediately for drying and then disposed of in an environmentally sound manner. After being dried in drying beds, it may meet our solid waste disposal criteria. The liquid sludge that would be removed from the lagoons, however, would not meet the criteria for disposal in a solid waste site and need to be disposed differently or dried prior to disposal.

6. On page 13, the design of the percolation pond is also unrealistic. The proposed design will not allow any resting period from the flow of wastewater applied. The rates per day that I calculated would be 2.6 feet of water applied every day to the percolation pond based on the design numbers given. This application rate is excessive if any amount of treatment is expected. Given the location of this percolation pond, the location of the Columbia River, and the probable velocity of groundwater movement in the area, it is just an alternate method of discharge to the River. A direct outfall to the river may be more appropriate.

7. Page 14 talks about a compressor to operate all of the air-activated pumps. This to me is needlessly expensive. The cost of the compressor and the air activated diaphragm pumps indicated will be more than the cost of putting in submersible sewage pumps to do the same job. Submersible sewage pumps have similar clogging problems that air-activated diaphragm pumps have. Multiple smaller pumps also minimizes maintenance headaches related to the operation of the compressor. Past history in wastewater treatment plants has shown that air-operated diaphragm pumps require very dry air for continuous use because ice forms within the valve mechanism.

8. Page 15. There is a discussion of the range of the influent and effluent flowmeters. The indicated range is too low for the peak flow. A 0-400 gallon per minute range only gives a peak of 576,000 gpd which is less than would be expected as a peak flow based on the design average flow. A more appropriate range might be from 0 to 600 gpm which would measure nearly 800,000 gpd, about 2-1/2 times the average flow. Flow monitoring into the two ponds needs to be by gallons per minute rather than feet per second. Using gallons per minute, you can establish that you actually have an equal division of flow between the two ponds.

9. Page 16, the discussion of oxygen and sludge monitoring. As mentioned previously, there are no dissolved oxygen meters on the market satisfactory for continuous use. The sludge level sensor proposed is of dubious value for sludge pumping. The same information can be determined using a sludge judge for sludge depth, operating calculations, and timers on the return sludge pumps.

10. Page 17 talks about sampling equipment. One sampler is not adequate. There will need to be at least two samplers. One sampler is to monitor the influent to the system and the other sampler to monitor the effluent from the system. Treated effluent is the discharge to the seepage bed or the river outfall. The sample size collected by the composite samples should be as close to 3 or 4 litres as possible. This would give a much more representative sample than the proposed half gallon composite sample would provide..

11. Page D-3 mentions that Washington State Criteria for leakage from ponds is 1/4 inch per day. This is out of date. Our current criteria is 1/10 inch per day. All in all, I prefer alternative one given in Appendix D (facultative and stabilization ponds). I prefer this alternative because very little operator attention is required and there are essentially no mechanical components needed by this kind of system. The system can be basically set and operated with only weekly attention. Lagoon system design is based on the coldest temperature expected and the design load. The aerated lagoon and activated sludge system proposed for implementation would require daily operator attention of approximately four hours per day, with eight hours per day needed on those days where samples are collected for compliance purposes. Additional sampling would be required for operational controls. These operational tests, calculations, and adjustments would take the bulk of the four hours per day that the operator would have to spend at the proposed plant.

12. Page D-6. Advantage No. 3 for the proposed system discusses the plant running for days without any adjustments made to the operation. While this is a true statement, oxidation ditches do not work well without daily adjustments and sludge wasting. Two concepts that were not addressed in Appendix D would have just one oxidation ditch or one package plant to do all treatment. Both of these processes are used for equivalent size domestic facilities in Washington.

    One other alternative that became apparent when I located the 300 area on a map would be to pump all flows about two miles to the City of Richland collection system in North Richland. If that option were used, the 300 area wastes would be mixed with about 5 mgd of city-generated waste. The City of Richland treatment plant is currently overdesigned and the waste from the 300 area would only serve to improve the ability of Richland to treat their existing wastewater. This may be a less expensive treatment process. I recognize that going to Richland could take a great deal of negotiating time before it could occur.

If you so desire, I would be happy to attend a meeting between you and the appropriate engineering staff for this project and discuss my concerns and suggestions. I would also be willing to participate in any future engineering reviews that may be desired.

AN:jsr